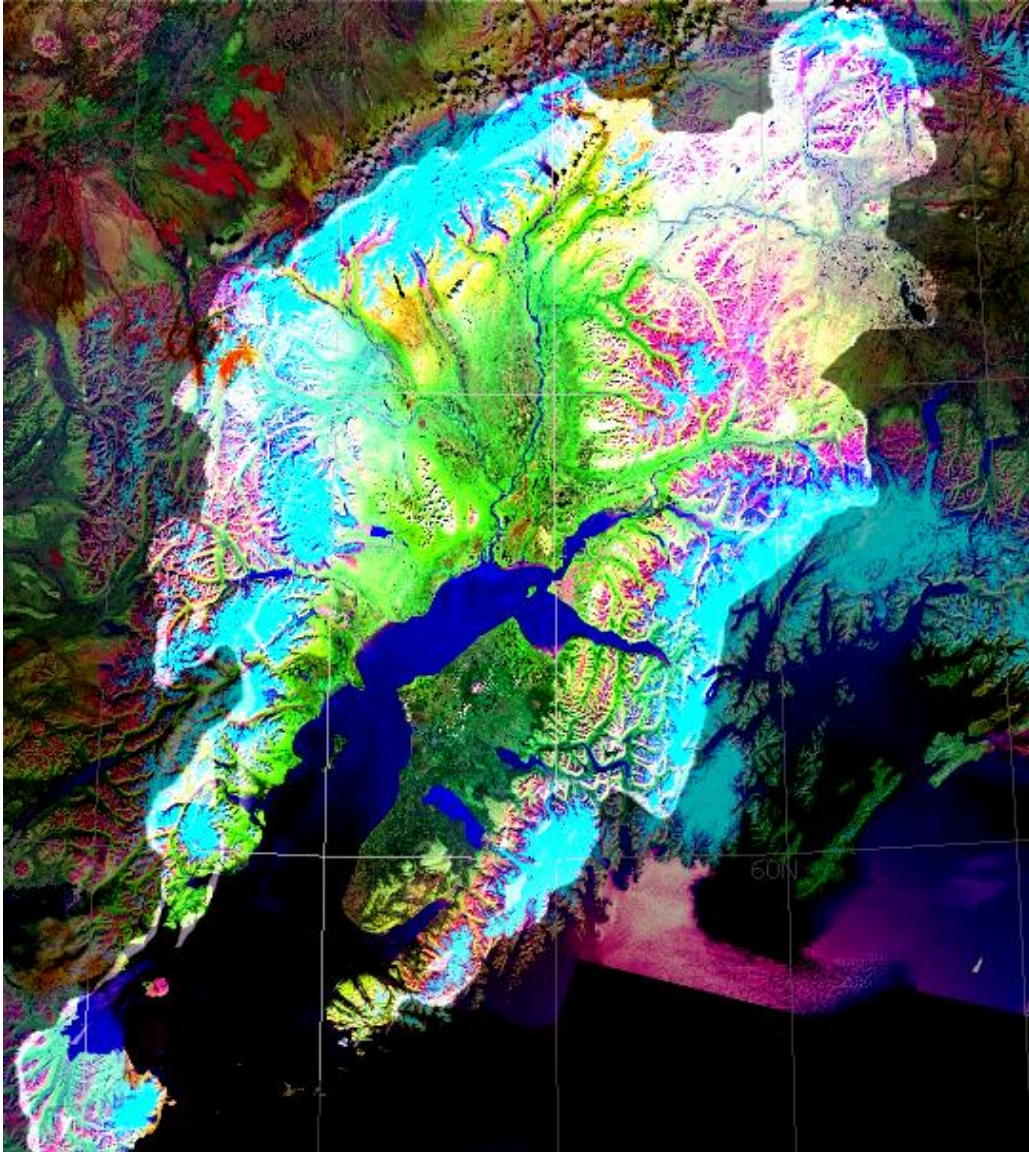


**Alaska Monitoring and Assessment Program (AKMAP)
Cook Inlet Drainage Basin, Alaska, Lakes Assessment
A Part of the U.S. EPA National Lakes Assessment Program**



**Prepared by the
Alaska Department of Environmental Conservation
Division of Water
Water Quality Assessment and Monitoring Program
Fairbanks, Alaska**

**Submitted to U.S. EPA
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National Lakes Assessment

The Environmental Protection Agency (EPA) intends to complete a comprehensive “State of the Lakes” assessment for lakes, ponds, and reservoirs across the United Statesⁱ. This assessment will include stratified random sampling in each of the contiguous states. Due to Alaska’s vastness and scale a statewide random sampling design is not realistic. Alaska will instead work closely with EPA in creating a regional sampling design that best fits AK’s and the Nation’s needs. A regional environmental assessment approach will allow AK to participate the National Lakes Assessment, build partnerships with other state or federal agencies, build capacity and demonstrate AK’s willingness and ability to complete such studies.

Cook Inlet Ecoregion

In Alaska, the main causes for water body pollution are urban runoff and agricultural activity. The only agriculture activity of any significance is within the Cook Inlet Basin. Other agriculture in the state is less than half of the small scale, by national standards, found in the Mat-Su Valley (upper reaches of the Cook Inlet Basin). The Cook Inlet basin located in southcentral Alaska is 39,325 mi², slightly smaller than Kentucky. Although it supports more than half of Alaska’s population, large portions of the region’s natural environment remain intact. Alaska proposes to focus our study efforts within this Ecoregion.

Physical Characteristics

There are four hydrologic units located within Cook Inlet: the Susitna River Basin, Anchorage/Matanuska, Kenai Peninsula and the Western Cook Inlet Basin. Altitude ranges from 12,320 ft at Mt. McKinley to sea level, glacial and non glacial streams and lakes are common for all basins. Glaciers cover roughly 11 percent of the Ecoregion. The exact number of freshwater lakes in the Cook Inlet is estimated at over 1000. Major features of this region include world class sport fishing, active volcanoes, the Chugach National Forest, the Kenai National Wildlife Refuge, several National Parks, glaciers and the state’s largest population centerⁱⁱ.

There are three main climate zones: the Continental, Transitional, and Maritime Zones. The temperature, type and amount precipitation, and humidity experience wide ranges throughout the Cook Inlet. Precipitation ranges from 20-240 in annually, much of this is snowfall and stored in the high mountain ranges in glaciers or icefields. Temperature averages range from 20 to 42 F in the region. The Maritime Zone is the warmest, wettest and lacks the extended freezing weather other regions experience.

The Cook Inlet Basin encompasses six ecoregions. The ecoregions vary in topography, altitude, soil, ice cover, climate, vegetation and permafrost conditions.

- **Alaska Peninsula Mountains**-maritime climate, permafrost free, scrub vegetation, surrounded by volcanoes.

- **Cook Inlet**-mild climate, largest population center, permafrost free, spruce/hardwood forests, sea level.
- **Alaska Range**-glacier, icefields, lack of vegetation predominant but some dwarf scrub vegetation, high altitude, rocky slopes.
- **Cooper Plateau**- shallow permafrost table, black spruce forest and tall scrubs, poorly drained soils, numerous lakes and wetlands.
- **Pacific Coastal Mountains**-steep rugged mountains, glacier, icefields, lack of vegetation predominate but some dwarf and low scrub vegetation, more precipitation than the Alaska Range.
- **Coast Forest**-narrow steep valleys, high sea cliffs, mildest winter temperatures, large amounts of precipitation, hemlock and Sitka Spruce forests.

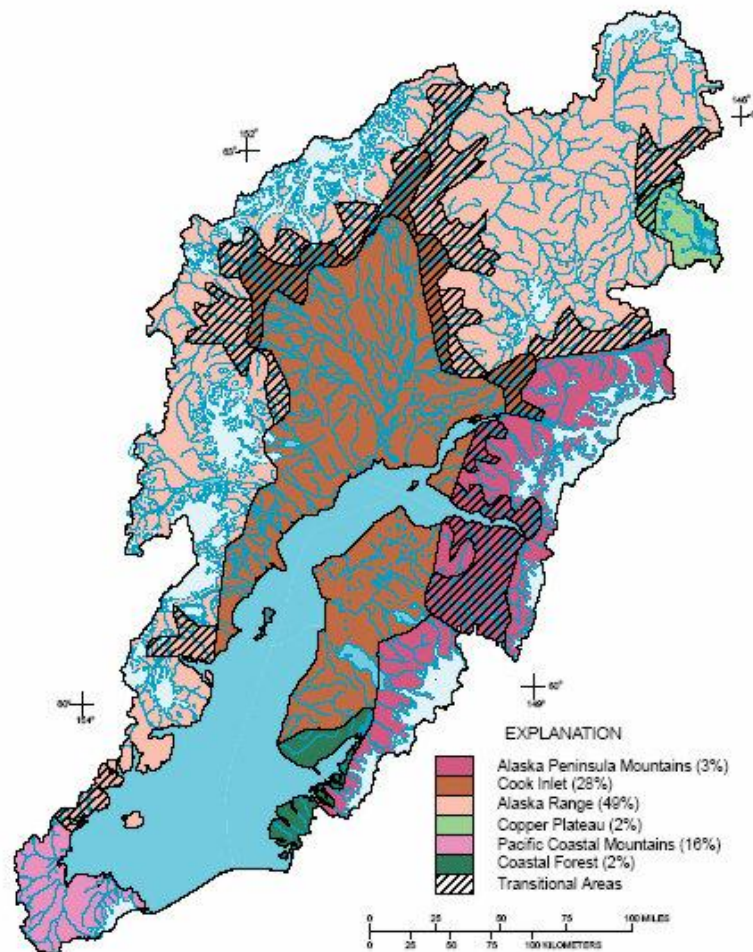


Figure 11. Ecoregions of the Cook Inlet Basin, Alaska (modified from Gallant and others, 1995).

Physical Characteristics of the Cook Inlet Basin 28

Water Quality Concerns

Residential development, timber harvesting, intense recreational use, agriculture, mining, petroleum and petrochemical development may degrade water quality throughout the

Cook Inlet Ecoregion. Determining water quality conditions in affected and unaffected areas will help protect the resource and influence policy and management decisions. Parameters that may be affected include: suspended sediment, alkalinity, dissolved solids, and nutrients.

Agriculture in the Cook Inlet Basin is focused within the Matanuska-Susitna Valley. There are approximately 10,500 head of cattle, around 1300 sheep, and 800 pigs in the entire state, with no more than a couple hundred in a single placeⁱⁱⁱ. Anchorage, the largest population center in Alaska is located within the Cook Inlet Ecoregion. Anchorage, along with its surrounding communities and the Matanuska-Susitna Borough supports over half of the states population.

Alaska's Nutrient Criteria Development Project

In addition to participating in EPA's "Survey of the Nation's Lakes" Alaska is currently in the process of developing regional nutrient criteria for the Matanuska -Susitna Valley. Nutrient over enrichment is leading cause of impairment in lakes and coastal waters nationally. Excess nutrients can generally be attributed to anthropogenic factors like excess fertilization, sewage treatment plants, detergents, septic systems, combined sewer overflows, siltation, atmospheric deposition, and internal nutrient recycling from sediments^{iv}. The Matanuska-Susitna Valley is the most at risk for nutrient over enrichment and would benefit the most from a regional criterion.

In the development of a regional nutrient criterion ADEC will utilize previously collected data as well as develop a sampling plan. This plan will follow methods and protocols set for the Cook Inlet Ecoregional Lakes Assessment. This will allow ADEC to utilize Lakes Assessment data in the development of nutrient criteria, creating a more robust data set and ensuring that nutrient criteria that are representative of the region.

Methods and Survey design

Alaska will utilize agreed upon methods and protocols set forth by EPA, with the majority found in the *Lake Evaluation Guidelines*. All data collection, management and analysis will be performed under EPA's QAPP for the National Lakes Assessment. Alaska may choose to add additional parameters on the National Lakes Assessment sampling regime, these additional parameters will follow standard sampling methods.

In addition, we anticipate dropping several parameters due to a lack of resources, inability to meet holding times, or because it is not applicable to Alaskan conditions. Bacteria sampling is an example. Not only we will be unable to meet holding times, the information collected will not be useful. The majority of lakes we anticipate sampling are remote, roadless, with little or no anthropogenic influences.

Collaboration

The project will be managed by ADEC in collaboration with the University of Alaska and the USGS Alaska office. This collaboration will help us in assessing the information

gathered by this project in identifying watershed or waterbody specific data needs. Located with the Cook Inlet Ecoregion are federal, state and Indian lands. When selected lakes fall within these boundaries the appropriate agency will be contacted.

ADEC is responsible for overall project management, grant management, and ensuring that project objectives, including Quality Assurance, data analysis and interpretation and reporting, are met and deliverables submitted on time.

University of Alaska Environmental and Natural Resources Institute (ENRI) will be assisting in field sampling and invertebrate and physical stream analysis. In addition ENRI will be providing lab bench space, freezer space and computer support. Input into data analysis, interpretation and reporting will be provided by staff experienced in evaluating water quality in Alaskan freshwaters.

USGS will provide technical geo-spatial information. They will provide and edit electronic maps of the region. Matching funds will be used to fund this project. Once maps are created and a lake selection has been drawn ADEC will be able to develop a sampling plan and a more accurate budget.

ⁱ USEPA 2006. Survey of the Nation's Lakes: Lake Evaluation Guidelines.

ⁱⁱ T. Brabets G. Nelson, J. Dorava and A. Milner. *Water Quality Assessment of the Cook Inlet Basin, Alaska-Environmental Setting*. National Water-Quality Assessment Program, USGS, 1999.

ⁱⁱⁱ B. Benz, M. Roos. *Alaska Agricultural Statistics 2001*. Alaska Agricultural Statistics Service, USDA, 2001.

^{iv} USEPA 1998. National Strategy for the Development of Regional Nutrient Criteria. EPA 822-R-98-002. U.S. Environmental Protection Agency; Washington , DC.